

Claims:

1. A method of drilling a subsea wellbore, comprising:
circulating a drilling fluid through a first flow path to a drill bit in the wellbore,
the fluid flowing upwards in a second flow path within the wellbore; and
pumping the fluid and drill cuttings from the second flow path to a fluid
handling system having at least two plungers operating in a predetermined phase
relationship.
2. The method of claim 1, wherein the at least two plungers operate
substantially counter synchronously.
3. The method of claim 2, wherein the plungers are moved in a first direction by
the fluid and in a second direction by power fluid provided from the surface.
4. The method of claim 1, wherein the fluid handling system is disposed at a sea
floor.
5. The method of claim 1, wherein the fluid handling system is disposed on a
riser at a location between the surface and a sea floor.
6. A method of transporting cuttings from a subsea wellbore, comprising:
urging the cuttings in a fluid slurry from an annular area in the wellbore to a
pump assembly in fluid communication with the wellbore;
utilizing the slurry to operate at least one plunger member of the pump
assembly in a first direction; and
utilizing a power fluid to operate the at least one plunger in a second
direction, thereby pumping the slurry towards the surface of the sea.
7. A method of reducing equivalent circulating density in a subsea wellbore,
comprising:

pumping a fluid through a drill pipe from a surface of water to a drill bit in a wellbore;

circulating the fluid and cuttings to the top of the wellbore; and

adding energy to the fluid and cuttings with a multi-phase pump, thereby urging the fluid and cuttings to the surface.

8. The method of claim 7, wherein the multi-phase pump includes at least two plungers operating in a predetermined phase relationship.

9. The method of claim 8, wherein plungers operate substantially counter synchronously.

10. A sub-sea fluid pumping system, comprising:

a pair of substantially counter synchronous fluid pumps locatable adjacent a sub-sea wellbore and in fluid communication with an annulus therein;

at least one fluid path for communicating wellbore fluid between the annulus and the fluid pumps; and

at least one power fluid line for providing power fluid to the fluid pumps.

11. The system of claim 10, wherein the pair of substantially counter synchronous fluid pumps are a pair of plungers, each plunger movable between an extended position and a retracted position.

12. The system of claim 11, wherein the wellbore fluid urges the plunger to the extended position.

13. The system of claim 11, further including a control line for providing a fluid to urge the plunger to the extended position.

14. The system of claim 11, wherein the power fluid urges the plunger to the retracted position.

15. The system of claim 11, further including a seal assembly disposed around each plunger to constantly scrape and polish each plunger as it moves between the extended position and the retracted position.

16. The system of claim 15, wherein the seal assembly includes a plurality of rings disposed on either side of a sealant.

17. The system of claim 16, wherein the sealant is remotely injected during the operation of the fluid pumps.

18. The system of claim 10, further including a pulsation control assembly to control the back pressure in a sub-sea wellbore due to the movement of the pair of substantially counter synchronous fluid pumps.

19. The system of claim 18, wherein the pulsation control assembly includes an accumulator piston disposed in a gas filled accumulator.

20. The system of claim 10, further including a plurality of upper valves to control the amount of power fluid to the pair of fluid pumps.

21. The system of claim 10, further including a plurality of lower valves to control the amount of wellbore fluid entering the pair of fluid pumps and the amount of discharge fluid exiting the pair of fluid pumps.

22. The system of claim 10, wherein the fluid pumps are operatively connected to a guide base.

23. The system of claim 22, wherein the fluid pumps may be individually inserted and retrieved from the guide base.

24. The system of claim 10, further including a gas line for removing gas from the pair of fluid pumps to prevent gas lock during a pump cycle.

25. The system of claim 10, wherein the fluid pumps are operatively connected to a riser pipe.

26. A sub-sea fluid pumping system, comprising:

- a pair of substantially counter synchronous fluid pumps disposed on a riser pipe at a location between a surface and a sea floor, whereby the fluid pumps are in fluid communication with an annulus of a sub-sea wellbore;

- at least one fluid path for communicating wellbore fluid between the annulus and the fluid pumps; and

- at least one power fluid line for providing power fluid to the fluid pumps.

27. The system of claim 26, wherein the pair of substantially counter synchronous fluid pumps are a pair of plungers, each plunger movable between an extended position and a retracted position.

28. The system of claim 26, wherein the fluid pumps may be individually inserted and retrieved from the riser pipe.

29. A method for pumping a wellbore fluid, comprising:

- placing a sub-sea pump system adjacent a sub-sea wellbore, the pump system including:

- a pair of substantially counter synchronous fluid pumps;

- at least one fluid line for communicating a wellbore fluid between an annulus of the sub-sea wellbore and the fluid pumps; and

- at least one power fluid line;

- filling the fluid pumps with the wellbore fluid to urge a plunger in each fluid pump to an extended position;

PATENT

Attorney Docket No.: WEAT/0392

Express Mail No.: EV351034032US

pumping a power fluid to the fluid pumps through the at least one fluid line,
the power fluid urge the plunger to a retracted position;

removing gas from the fluid pumps through the plurality of gas lines to
prevent gas lock during a pumping cycle; and

pumping the wellbore fluid into a discharge line.

30. The method of claim 29, further including separating a gas portion in the wellbore fluid from a liquid portion and allowing the gas portion to migrate to an upper portion of the fluid pumps.

31. The method of claim 30, further including pressurizing the gas in the fluid pumps.

32. The method of claim 31, further including communicating the gas through the plurality of gas lines to the discharge line.

33. The method of claim 29, further including directing the power fluid into the fluid pumps by a plurality of upper valves.

34. The method of claim 29, wherein the pair of substantially counter synchronous fluid pumps are a pair of plungers, each plunger movable between an extended position and a retracted position.

35. The method of claim 34, further including scraping and polishing each plunger as it moves between the extended position and the retracted position.

36. The method of claim 29, further including controlling the back pressure in a sub-sea wellbore due to the movement of the pair of substantially counter synchronous fluid pumps.

37. A fluid separator system, comprising:

at least one plunger assembly, each plunger assembly includes a plunger movable between an extended position and a retracted position;

at least one fluid line for removing a fluid portion from the at least one plunger assembly; and

at least one gas line for removing a gas from the at least one plunger assembly.

38. The system of claim 37, wherein each plunger assembly includes a lower plunger chamber with an enlarged chamber formed at a lower end thereof.

39. The system of claim 38, wherein a liquid level is maintained in the enlarged chamber to ensure that a substantial portion of the gas is removed from the at least one plunger assembly.

40. The system of claim 38, wherein the enlarged chamber is constructed and arranged in a substantially circular shape and includes a wellbore inlet.

41. The system of claim 40, wherein the wellbore inlet is constructed and arranged to allow wellbore fluid to enter the enlarged chamber tangentially to promote the separation of the gas portion from the fluid portion of the wellbore fluid.

42. The system of claim 41, further including a plurality of ports formed in the lower plunger chamber and the plurality of ports are in fluid communication with the at least one gas line.

43. The system of claim 37, further including a control in fluid communication with the at least one fluid line to control the timing and amount of the fluid portion exiting from the at least one plunger assembly.

PATENT

Attorney Docket No.: WEAT/0392

Express Mail No.: EV351034032US

44. The system of claim 43, wherein the control includes a feed back loop that controls the flow of the fluid portion based upon the pressure differential of the fluid portion.

45. The system of claim 37, further including a deflector plate operatively mounted on a sloped portion of a lower plunger chamber.

46. The system of claim 45, whereby the deflector plate is constructed and arranged to promote the separation of the gas portion from the fluid portion of a wellbore fluid.

47. A method of separating wellbore fluid, comprising:
communicating wellbore fluid to a multiphase pump system, the pump system including:

a pair of substantially counter synchronous fluid pumps;

at least one fluid line; and

at least one gas line;

separating a gas portion and a fluid portion from the wellbore fluid; and

delivering the gas portion to the at least one gas line and the fluid portion to the at least one fluid line.

48. The method of claim 47, further including removing the gas portion from the fluid portion by allowing the gas portion to migrate to an upper portion of the fluid pumps.

49. The method of claim 47, further including spinning the wellbore fluid to promote the separation of the gas portion from the fluid portion of the wellbore fluid.

50. The method of claim 47, wherein the pair of substantially counter synchronous fluid pumps are a pair of plungers, each plunger movable between an extended position and a retracted position.

PATENT

Attorney Docket No.: WEAT/0392
Express Mail No.: EV351034032US

51. The method of claim 50, further including scraping and polishing each plunger as it moves between the extended position and the retracted position.

52. The method of claim 47, further including controlling the timing and amount of the fluid portion exiting from the pair of substantially counter synchronous fluid pumps.